Forest Research Notes

Northeastern Forest Experiment Station

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KILLING CULL TREES WITH AMMATE CRYSTALS --A CASE STUDY

The use of ammate (ammonium sulfamate) as a tree-killing agent has become widespread during recent years; it is well established as an effective and economical silvicide. The purpose of this report is to supplement present knowledge and also to present a case study on the use of ammate in practical application.

Ammate has been used for the past 10 years as a silvicide on the Fernow Experimental Forest, Parsons, W. Va. The deadening of undesirable trees is an integral part of the stand treatments in many timber management studies on the Fernow. The data presented here deal with costs of application and percents of kill with time.

Methods

In all treatments in this study, ammate in crystalline form was applied in notches cut into the tree trunks at convenient chopping height above the ground, usually about $2\frac{1}{2}$ feet. One tablespoon of the crystals was placed in each notch. Notches cut by expert axmen were spaced about 4 inches apart, edge to edge, or in practice about an ax-blade width apart. Thus, for a tree 6 inches in diameter at breast height, 2 notches usually were cut; for a 10-inch tree, 4 notches; and for a 20-inch tree, 7 to 9 notches.

Three areas--A, B, and C--were included in the study. The cull trees on one area (C) were treated in 1957, on another (B) in 1958, and on the last (A) in 1960. All treating was done during the growing season. In 1960, about 30 days after the last treatment was applied, a sample of ap-

proximately 240 trees on each area was examined and tallied. Effects of treatment were appraised on the basis of defoliation; only completely defoliated trees were tallied as killed.

Results

Percentages of kill were based on numbers of trees sampled. On Area A, where treating had been done only 30 days before the examination, 45 percent of the sampled trees were completely defoliated. Kills progressed with time: Area B, 22 months after treatment, showed a 66-percent kill, while Area C, 37 months after treatment, showed a 91-percent kill (table 1).

Treatments were somewhat more effective, however, than the kill percentages indicated. With the exception of one 6-inch beech on Area C, every tree examined on the three areas exhibited foliar damage. The treated trees that still lived showed the following average percents of crown kill, based on an ocular estimate of each tree: Area A - 84, Area B - 95, Area C - 97. These almost dead trees offer little competition for moisture, nutrients, and growing space. The ammate crystals, as here applied, were highly effective the first season, and by the third year were almost totally effective in eliminating the competitive influence of the treated trees.

Ammate has been highly effective in killing beech root suckers. When cull beeches are killed by girdling, worthless root suckers often replace the parent trees and little, if any, stand improvement results. Observations made on 25 ammate-treated beeches 2 months after treatment showed an average of three root suckers affected and one killed for each tree treated. Past experience indicates that most of such affected sucker stems eventually die.

Twenty different hardwood species were treated. In the tabulation below, the species that were sampled in appreciable numbers are divided into three groups based on apparent ease of killing by the ammate-notch method.

Easy to kill	*Intermediate*	*Difficult to kill*
Black gum	Red oak group	Birch (black and yellow)
Sour wood	White oak group	Sugar maple
Service berry	Beech	
Cucumber magnolia	Red maple	
Black locust	Hickory	
Basswood		
Sassafras		

This grouping, however, is presented with reservations because species are confounded with average tree

Table 1.--Percents of kill for three time intervals after treatment, and average diameters of the trees by areas

Area	Date of treatment	Date of observation	Elapsed time	Trees examined	Average d.b.h. of observed trees	Average d.b.h. of dead trees	Trees killed
			Months	Number	Inches	Inches	Percent
A	May 1960	June 1960	1	244	13.7	10.8	45
B	August 1958	June 1960	22	235	16.4	14.6	66
C	May 1957	June 1960	37	238	14.9	14.5	91

Table 2.--Costs of ammate treatment, by areas, based upon labor at $1.20 per hour and ammate at $0.245 per pound

Area	Size	Treated trees	Labor time	Amount of ammate	Cost of labor and material	Average d.b.h. of treated trees	Cost per tree	Trees per acre	Tree d.b.h. inches per acre[1]	Cost per acre	Cost per d.b.h. tree inch
	Acres	Number	Man hours	Pounds	Dollars	Inches	Cents	Number	Number	Dollars	Dollars
A	23	328	45	120	83	13.2	25.3	14.3	189	3.61	0.019
B	158	1,023	122	255	209	12.8	20.4	6.5	83	1.32	.016
C	76	766	84	240	160	12.7	20.9	10.1	128	2.11	.016

[1]Computed as the product of the average number of trees per acre times average d.b.h.

Table 3.--Tree diameter-inches treated per man-hour and per pound of ammate

Area	Acres	Tree inches	Tree inches per man hour	Tree inches per pound of ammate
A	23	4,347	97	36
B	158	13,114	107	51
C	76	9,728	116	41
Average	--	--	108	44

sizes: species in the easy-to-kill group mostly are represented by comparatively small trees, whereas the difficult-to-kill group mostly comprises the largest trees. Since kills among the smaller trees of a given species tend to be greater than among the larger ones, the grouping probably reflects some differences due to tree size that may have led to erroneous rating of certain species. The correlation between ease of killing and size is shown in table 1 by the smaller average diameters of all dead trees than of all treated trees.

Costs of treatment vary with a number of factors including season of the year, size and accessibility of the area, tree size, number of trees per acre, competence of labor, and so forth. In this study, the same methods and same crew were used on all areas. The labor rate applied in computing costs was $1.20 an hour and the cost of ammate was $0.245 per pound. Supervisory costs and cull-marking costs were not included. Six to 15 culls were treated per acre; per-acre costs ranged from $1.32 to $3.61 (table 2). Average cost per inch of tree diameter at b. h. for the three areas was $0.017.

Since labor costs vary greatly and since the price of ammate may vary also, costs have been computed on the basis of number of tree diameter inches per man hour and number of diameter inches per pound of ammate (table 3). On the average, 108 tree diameter-inches were treated per man-hour, and 44 inches were treated per pound of ammate. These rates offer a good method of estimating costs where travel time to the woods is not a big factor, and where trees are not more scattered than in our study areas.

--HARRY W. YAWNEY
Research Forester
Northeastern Forest Experiment Station
Forest Service, U.S. Dept. Agriculture